Chamaesyce celastroides var. *kaenana*
(Akoko)

5-Year Review
Summary and Evaluation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

5-YEAR REVIEW
Chamaesyce celastroides var. *kaenana* (Akoko)

I. GENERAL INFORMATION

A. Methodology used to complete the review

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the Fish and Wildlife Service between July 2005 and June 2006. The Hawaii Biodiversity and Mapping Program was contracted to provide updated information on the current status of *Chamaescye celastroides* var. *kaenana*. They also provided recommendations for future actions that may be needed prior to the next 5-year review. The evaluation of the lead PIFWO biologist was reviewed by the Plant Recovery Coordinator, whose comments were incorporated into the draft 5-year Review. The draft 5-year Review was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before PIFWO submission to the Regional Office.

B. Reviewers

Lead Region: Region 1

Lead Field Office: Pacific Islands Fish and Wildlife Office

C. Background

1. FR Notice citation announcing initiation of this review:

U.S. Fish and Wildlife Service. July 6, 2005. Endangered and Threatened Wildlife and Plants; Initiation of 5-year Reviews (of 33 species in Region 1). 70 FR 38972-38975.

2. Species status:

Improving (FY 2006 Recovery Data Call)

3. Recovery achieved:

1, meaning 0 - 25 percent of the identified recovery objectives for *Chamaescye celastroides* var. *kaenana* have been achieved (FY 2006 Recovery Data Call)

4. Listing history

Original Listing

FR notice: U.S. Fish and Wildlife Service. 1991. Endangered and threatened wildlife and plants; determination of endangered status for 26 plants from the Waianae Mountains, island of Oahu, Hawaii. *Federal Register* 56(209): 55770-55786.

Date listed: October 29, 1991

Entity listed: Variety

Classification: Endangered

Revised Listing, if applicable
N/A

5. Associated actions:
Critical habitat was designated for *Chamaesyce celastroides* var. *kaenana* in five units totaling 1,365 acres (554 hectares) on Oahu (U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 101 plant species from the island of Oahu, Hawaii. *Federal Register* 68(116): 35950-36406).

6. Review History:
Just the original listing, designation of critical habitat, and recovery plan development actions.

7. Species' Recovery Priority Number at start of review: 9, meaning a subspecies with a moderate degree of threat and a high recovery potential.

8. Recovery Plan or Outline

Name of plan: Recovery Plan for the Oahu Plants. 1998. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pp. plus appendices
Date issued: August 10, 1998
Dates of previous revisions: N/A
Some of the actions outlined in the Recovery Plan have been initiated but not completed (*e.g.*, construct exclosures to protect populations from off-road vehicles). Some recovery actions will require long-term commitments (*e.g.*, maintenance of exclosure fences and weed control) or may only be necessary intermittently (*e.g.*, provide protection against fire).

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) Policy
This Policy does not apply to plant species.

B. Recovery Criteria

1. Does the species have a final, approved recovery plan?
__X__ ***Yes***
No

2. Does the recovery plan contain recovery (i.e., downlisting or delisting) criteria?
__X__ ***Yes***
No

3. **Adequacy of recovery criteria.**

a. **Do the recovery criteria reflect the best available (i.e., most up-to-date) information on the biology of the species and its habitat?**

X _ *Yes*
No

b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)?**

__X__ *Yes*
____ *No*

4. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors* are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.**

The threats (Factors A, B, C, and E) affecting this species are discussed in detail in section II.D. Factor D is not considered a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the Recovery Plan for Oahu Plants (Service 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Chamaesyce celastroides* var. *kaenana* is a short-lived perennial, and to be considered stable, this species must be managed to control threats (e.g. fenced) (Factors A, C, and E) and be represented in an *ex situ* collection. In addition, a minimum of three populations should be documented on the island of Oahu where the species now occurs or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Chamaesyce celastroides* var. *kaenana* should be documented on the island of Oahu where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats (Factors A, C, and E), with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of 5 consecutive years before downlisting is considered.

A)Present or threatened destruction, modification or curtailment of its habitat or range;
B) Overutilization for commercial, recreational, scientific, or educational purposes;
C) Disease or predation;
D) Inadqequacy of existing regulatory mechanisms;
E) Other natural or manmade factors affecting its continued existence.

For delisting, a total of 8 to 10 populations should be documented on the island of Oahu where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable, or increasing in number, and secure from threats (Factors A, C, and E), with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of 5 consecutive years before delisting is considered.

This recovery objective has not been met.

The major threats identified for *Chameasyce celastroides* var. *kaenana* at the time of listing included competition from the nonnative plant *Leucaena leucocephala* (koa haole; Factor E), fire (Factors A and E), and the effects of recreational activities (Factors A and E) (56 FR 55770).

C. Synthesis

Chamaesyce celastroides var. *kaenana* is one of eight currently recognized varieties which are endemic to the main Hawaiian Islands as well as the island of Nihoa in the Northwestern Hawaiian Islands (Koutnik 1990). Historically, *C. celastroides* var. *kaenana* was known from the northwestern end of the Waianae mountains of the island of Oahu, with one collection by Hillebrand in the late 1800s from the southeastern end of the Koolau mountains on Oahu (Hawaii Heritage Database 1990; Koutnik and Huft 1990). At the time of listing, 5 populations of *C. celastroides* var. *kaenana* were found within a 1 by 3 mile (1.6 by 5 kilometer) area at Kaena Point, consisting of fewer than 200 individuals (Hawaii Heritage Database 1990). When the Recovery Plan for the Oahu Plants was published, 7 populations of approximately 80 individuals were found at Keawaula; 450 individuals were found at Kaena Point; 12 individuals were found at Alau Gulch; and 3 individuals were found at Waianae Kai, for a total of 10 populations of 545 individuals (Service 1998). The discovery of new populations of *C. celastroides* var. *kaenana* within the last 25 years has led to extensions of the known range of the taxon. Currently, more than 900 individuals are known, more than half of which are located on the Makua Military Reservation, with the remainder within the Kaena Point Natural Area Reserve and at Waianae Kai (Makua Implementation Team 2003; U.S. Army 2006; HBMP 2006; J. Lau, Hawaii Biodiversity and Mapping Program, pers. comm. 2006).

Chamaesyce celastroides var. *kaenana* apparently hybridizes with *C. celastroides* var. *amplectens,* which is a common variety of the species. Variety *amplectens* occurs with or near var. *kaenana* in the inland portion of var. *kaenana*'s range. Only a few putative hybrid individuals have been observed in Waianae Kai. However, in part of Punapohaku Gulch on the north side of Kahanahaiki Valley in the Makua Military Reservation, there are many apparent hybrids. These plants are highly variable, and appear to constitute a hybrid swarm. Both varieties of *Chamaesyce celastroides* occur in other portions of Punapohaku Gulch, but no hybrids between the two varieties have been observed in these areas (Makua Implementation Team 2003; J. Lau, pers. comm. 2006).

Feral goats (*Capra hircus*) are a threat to the *Chamaesyce celastroides* var. *kaenana* (Factors A and C). The goat, a species originally native to the Middle East and India, was successfully

introduced to the Hawaiian Islands in 1792. Feral goats eat native vegetation, trample roots and seedlings, cause erosion, and promote the invasion of alien plants. They are able to forage in extremely rugged terrain and have a high reproductive capacity (Clarke and Cuddihy 1980; van Riper and van Riper 1982; Scott et al. 1986; Tomich 1986; Culliney 1988; Cuddihy and Stone 1990). The population of *C. celastroides* var. *kaenana* in Waianae Kai is located on steep, nearly vertical cliffs and is thus out of reach of the feral goats, however, the goats are negatively affecting the habitat of these unreachable plants. Feral goats are now excluded from Makua valley where *C. celastroides* var. *kaenana* plants are found by an ungulate proof fence that was constructed along Makua Valley's southern and eastern rims (U.S. Army 2005; J. Lau, pers. comm. 2006).

Fire is considered a major threat to *Chamaesyce celastroides* var. *kaenana* (Factors A and E). *Chamaesyce celastroides* var. *kaenana* occurs in dry habitats and is not considered fire tolerant (Service 1998; 68 FR 35949). One potential source of fire is from military training activities on the Makua Military Reservation. The Army has addressed the threat of fire from their actions by developing and implementing a fire management plan to minimize the number of ignitions in the reservation, to respond rapidly to any ignitions, and to maintain fire breaks to help contain any ignitions away from the endangered species locations (U.S. Army 2003). *Chamaesyce celastroides* var. *kaenana* is also threatened by fires ignited through arson (Makua Implementation Team 2003). Several populations have been impacted by fires in the past, including the population east of Kaena Point, the populations in northern Kahanahaiki, those in southern Makua Valley, and the population at Waianae Kai (U.S. Army 2005; HBMP 2006).

At the time *Chamaesyce celastroides* var. *kaenana* was listed it was threatened by the effects from recreational activities at lower elevations along unpaved roads at Kaena Point Natural Area Reserve (Kaena Point NAR) (Factor B) (56 FR 55772). The Hawaii Division of Forestry and Wildlife has restricted off-road vehicle access to the Kaena Point NAR by constructing a large barrier on the northeast side of the reserve. Road access from the northwest side is prevented by a natural washout (Service 1998).

Competition from and habitat degradation by invasive nonnative plant species is a major threat to *Chamaesyce celastroides* var. *kaenana* (Factors A and E). The primary invasive nonnative plant species impacting *C. celastroides* var. *kaenana* include *Acacia confusa* (Formosan koa), *Grevillea robusta* (silk oak), *Hyptis pectinata* (comb hyptis), *Leucaena leucocephala* (koa haole), *Melinus repens* (natal redtop), *Panicum maximum* (Guinea grass), *Pluchea carolinensis* (sourbush), and *Schinus terebinthifolius* (Christmas berry) (U.S. Army 2005; 68 FR 35949).

In addition to all of the other threats, species like *Chamaesyce celastroides* var. *kaenana* that are endemic to a small portion of a single island are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by random demographic fluctuations and localized catastrophes such as hurricanes and disease outbreaks (Factor E). Under the terms of the 1999, 2001, and 2004 U.S. Fish and Wildlife Service Biological Opinions for routine military training at the Makua Military Reservation and the subsequent 2003 Makua Implementation Plan, the Army is addressing the threat from small numbers of populations and small population sizes through genetic storage (Service 1999; Makua Implementation Team 2003). Seed collection for genetic storage and possible future

reintroductions is also underway at the Audubon Society's Waimea Valley Park and at the Lyon Arboretum Seed Storage Facility (Service 2005; U.S. Army 2006). Propagation for reintroduction is occurring in the Army's baseyard, the University of Hawaii's Lyon Arboretum Micropropagation and Seed Storage Laboratories, the National Tropical Botanical Garden, and at the Audubon Society's Waimea Valley Park (U.S. Army 2005; Service 2005). The goal for genetic storage of *C. celastroides* var. *kaenana* is to collect seeds from up to 50 individuals from each population (Makua Implementation Team 2003). This goal has been partially met (U.S. Army 2005).

While the Army has initiated several actions to protect *Chamaesyce celastroides* var. *kaenana* and the species has reached the stabilization numbers, the threats have not all been controlled and genetic storage is not complete. Downlisting and recovery goals for this species have not been met and, therefore, *C. celastroides* var. *kaenana* meets the definition of endangered as it remains in danger of extinction throughout all of its range.

III. RESULTS

A. Recommended Classification:

____ Yes, downlist to Threatened
____ Yes, uplist to Endangered
____ Yes, delist
__X_ No, no change is needed

B. New Recovery Priority Number __N/A___

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- Search for individuals of *Chamaesyce celastroides* var. *kaenana* in the southeastern Koolau mountains.

- Study *Chamaesyce celastroides* var. *kaenana* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.

- Manage other populations of *Chamaesyce celastroides* var. *kaenana* that are not being managed by the U.S. Army staff.

V. REFERENCES

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EXPERTS CONSULTED

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Chamaesyce celastroides* var. *kaenana* (Akoko)

Current Classification Endangered

Recommendation resulting from the 5-Year Review

Downlist to Threatened
Uplist to Endangered
Delist
X **No change is needed**

Appropriate Listing/Reclassification Priority Number N/A

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Date JUL - 3 2007
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Approve
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